

Developing Inertial Fusion Energy - Where Do We Go From Here?

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In the U.S. Government Fiscal year 1996, approximately \$240M will be spent by the Department of Energy (DOE) Defense Programs (DP) on inertial confinement fusion (ICF). The near term goal of DP's ICF program is to complete the construction of the National Ignition Facility (NIF) and demonstrate ignition in an ICF capsule that will yield ~ 20 MJ in a single shot. The primary mission of the NIF is science based stockpile stewardship.

Another potential future application of ICF is the production of electric power. DOE's Office of Fusion Energy in Energy Research (ER) is currently spending ~\$8 M/yr on inertial fusion energy (IFE), primary in support of heavy ion driver R&D at Lawrence Berkeley National Laboratory (LBNL) and Lawrence Livermore National Laboratory (LLNL). For the past several years, we have been engaged in long term planning studies to identify the steps required to develop IFE. The plans are periodically updated to reflect changing budget constraints and technology developments. Although the DP mission beyond NIF is not clearly defined, in our planning we have assumed that DP will pursue high yield, single shot (or very low rep-rate) ICF applications and will develop the driver, target and chamber technologies needed for these applications. While IFE can leverage off the technology developed for ICF, there are many IFE-specific development needs that must be addressed by ER if IFE is to be advanced as an energy option. IFE-specific development needs include: high gain targets, high rep-rate, efficient drivers, high rep-rate, low cost target production, injection and tracking, and high rep-rate, high-fluence chambers. For energy applications, reliable, safe, and economical operation of the integrated system is required.

Our DP/ER plan for the development of IFE includes five main elements: Target Physics, Driver Technology, Target Systems (production and injection), Chamber Technologies, and Integrated Systems (e.g., an engineering test facility and pilot plant). In each category we show the current and planned ICF facilities and activities required for the DP mission along with the related IFE-specific R&D elements. Technologies to maintain both direct and indirect driver approaches are included in the planning. Technical milestones and decision points are indicated and costs for both DP and ER activities are estimated.

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